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THE JUNIOR COLLEGE STUDENT.

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USING DATA OBTAINED BY PROJECT TALENT, A NATIONWIDE STUDY OF HIGH SCHOOL YOUTH, THE AUTHORS DESCRIBE THE JUNIOR COLLEGE STUDENT. JUNIOR COLLEGE, NONCOLLEGE, AND SENIOR COLLEGE STUDENTS WERE COMPARED IN TERMS OF SIX MEASURES OF INFORMATION AND EIGHT MEASURES OF GENERAL APTITUDE AND ABILITY. THROUGH THE USE OF A 6-GROUP DISCRIMINANT ANALYSIS, IT WAS FOUND THAT JUNIOR COLLEGE STUDENTS TENDED TO BE MORE LIKE NONCOLLEGE STUDENTS IN ABILITY. HOWEVER, SEX DIFFERENCES IN THE ABILITY MEASURES WERE GREATER THAN THE DIFFERENCES AMONG THE THREE GROUPS ARRANGED ACCORDING TO THEIR COLLEGE PLANS. ALTHOUGH THE JUNIOR COLLEGE STUDENT RESEMBLED THE NONCOLLEGE STUDENT IN TERMS OF ABILITY, HE APPEARED TO BE MORE LIKE THE SENIOR COLLEGE STUDENT IN TERMS OF SOCIOECONOMIC FACTORS. THIS ARTICLE WAS PUBLISHED IN "THE PERSONNEL AND GUIDANCE JOURNAL," VOLUME 44, JANUARY 1966. (AUTHOR/GK)

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The Junior College Student

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CLEARINGHOUSE FOR
JUNIOR COLLEGE
INFORMATION

WILLIAM W. COOLEY

SUSAN J. BECKER

Using data obtained by Project TALENT, a nationwide study of high school youth, the authors describe the junior college student. The junior college, non-college, and college students have been compared along six measures of information and eight of general aptitude and ability. Through the use of a six-group discriminant analysis, it was found that junior college students have a tendency to be more like non-college students in terms of ability. However, sex differences on the ability measures were greater than the differences among the three college-planning groups. Although the junior college student looks more like the non-college student in terms of ability, he appears to be more like the college student in terms of socio-economic factors.

THE OBVIOUS growth in the number and size of America's junior colleges presents educators with another vital question to be answered: What type of students are attracted to and attend the junior college?

A broad approach to this question can be made by analyzing data obtained from a nationwide follow-up study of high school youth, known as Project TALENT. Project TALENT began in 1960 with the administration of a two-day test battery to 440,000 high school students in grades 9 through 12. These students attended schools in a five per cent probability sample of the population of high schools in the United States. Since then, these students have been followed through mailed questionnaires and personal interviews in an effort to determine their post high school plans and activities. One thing determined in these questionnaires is whether or not the student is going to college, junior college, or no college at all. With this type of data in the computer age, it is possible to observe a large number of junior college students and compare abilities and socio-economic characteristics with those of college and non-college students. Two types of variables from the Project TALENT data will be presented here. Three groups (non-college, junior college, and college) will be compared in terms of selected ability measures and in terms of their family socio-economic, cultural environment.

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THE ABILITY MEASURES

The ability measures selected for this report consist of six measures of information and eight measures of aptitude and achievement. The list of variables can be found in TABLE 1. Further descriptions of these scales and other aspects of Project

TALENT can be found in Flanagan, et al. (1962).

TABLE 1 lists the means and standard deviations for these 14 ability measures of the three criterion groups for over 16,000 males. It is not necessary to discuss statistical significance since all these are very significantly different. TABLE 2 presents the same information for over 18,000 females. Inspection of TABLES 1 and 2 reveals that the means of the junior college group fall between the college and non-college means in every instance. Occasionally, the junior college means are more like the college means, but there is a slightly greater tendency for the junior college students to be more like the non-college students. This tendency becomes clearer later in the discussion. Also, comparing TABLES 1 and 2, there are marked sex differences for most of the variables. Sometimes it is the males who did better than the females; other times just the opposite.

Although these three groups differ on the 14 variables to a highly significant degree, it is also of interest to talk about the extent to which they overlap. TABLE 3 shows the results for six of the variables. About a third of the junior college students fall below the non-college mean, and a third of them fall above the college mean for the corresponding sex. The remaining one-third of the junior college population falls between the average non-college stu-

TABLE 1

College, Junior College, and Non-College Ability Means and Standard Deviations (16,384 Males)

Variable	Non-College		Junior College		College	
	Means	Std. Dev.	Means	Std. Dev.	Means	Std. Dev.
R-102 Vocabulary Info	12.7	3.7	14.3	3.2	16.0	3.0
R-103 Literature Info	12.2	4.2	14.1	3.9	16.1	3.9
R-105 Social Studies Info	15.4	5.1	17.7	4.2	19.6	3.8
R-106 Mathematics Info	8.7	4.9	11.7	5.0	15.4	5.0
R-107 Physical Science Info	9.0	3.9	10.8	3.8	12.7	3.5
R-108 Biological Science Info	6.4	2.3	7.2	2.0	7.9	2.0
R-211 Memory for Sentences	8.6	3.0	9.0	2.9	9.3	2.9
R-220 Disguised Words	13.7	6.6	15.5	6.4	18.2	6.5
R-230 English Achievement	77.6	12.5	83.3	10.3	88.8	10.4
R-250 Reading Comprehension	28.9	10.2	34.0	8.6	38.2	7.7
R-260 Creativity	9.1	4.0	10.4	3.8	11.7	3.8
R-290 Abstract Reasoning	8.9	2.9	9.9	2.5	10.7	2.4
R-340 Mathematics Achievement	21.6	8.6	26.6	8.9	32.9	9.6
F-410 Arithmetic Computation	25.1	21.8	30.7	17.4	36.9	15.4

All differences between columns significant.

TABLE 2

College, Junior College, and Non-College Ability Means and Standard Deviations (18,646 Females)

Variable	Non-College		Junior College		College	
	Means	Std. Dev.	Means	Std. Dev.	Means	Std. Dev.
R-102 Vocabulary	11.6	3.8	13.3	3.5	15.2	3.3
R-103 Literature Info	12.2	4.0	14.2	3.8	16.2	4.1
R-105 Social Studies Info	13.7	4.7	15.7	4.3	18.0	4.1
R-106 Mathematics Info	6.7	4.3	9.2	4.8	13.0	5.2
R-107 Physical Science Info	6.5	3.4	7.5	3.6	9.9	3.8
R-108 Biological Science Info	5.5	2.2	6.1	2.2	7.1	2.0
R-211 Memory for Sentences	9.3	3.0	9.5	3.0	10.3	2.9
R-220 Disguised Words	16.0	6.9	17.6	6.4	19.7	6.2
R-230 English Achievement	85.1	11.9	89.1	9.5	94.0	9.1
R-250 Reading Comprehension	30.8	9.3	34.8	8.1	38.8	7.2
R-260 Creativity	8.5	3.6	9.5	3.6	10.8	3.6
R-290 Abstract Reasoning	8.8	2.9	9.7	2.5	10.5	2.3
R-340 Mathematics Achievement	19.8	7.6	23.3	8.1	29.5	9.3
F-410 Arithmetic Computation	30.9	17.7	34.1	14.5	38.6	14.7

All differences between columns significant.

TABLE 3

Per Cent of Junior College Students Above College Mean and Below Non-College Mean

Variable	% Below Non-College Mean		% Above College Mean	
	Males	Females	Males	Females
R-102 Vocabulary	31	31	28	28
R-105 Social Studies	29	33	32	29
R-106 Mathematics	27	30	23	21
R-107 Physical Sciences	31	39	30	25
R-260 Creativity	36	39	36	36
R-290 Abstract Reasoning	35	37	37	37

dent and the average college student. Another interesting result of these data is that the aptitude measures exhibit much greater overlap among the three criterion groups than do the information scales.

The availability of the computer today allows us to apply multivariate methods of analysis to data such as those summarized in TABLES 1 and 2, thus enabling the investigator to reduce the amount of information he has to think about in making generalizations about observations. With the data described in TABLES 1 and 2, a six-group discriminant analysis was performed using the same 14 variables. (The entire sample of 35,000 eleventh graders was not needed for the discriminant analysis. A randomly selected sub-sample of 1,000 students was used.) The six groups are listed in TABLE 4. The results of the discriminant analysis indicate that all of the information in the 14 variables regarding the differences among the six groups could be summarized in two discriminant functions or axes.[1]

[1] Computer programs used here are based upon those found in Cooley and Lohnes (1962).

TABLE 4

Centroids of Groups in Discriminant Space

	1	2
Non-College Males	11.89	29.10
Jr. College Males	11.78	33.43
College Males	11.27	39.87
Non-College Females	18.29	31.05
Jr. College Females	18.26	34.30
College Females	16.84	39.96

The first discriminant function accounted for 61 per cent of the discriminating information available in the 14 variables, and the second discriminant function accounted for 35 per cent. This means that 96 per cent of all the information regarding these group differences can be summarized in the first two discriminant functions are indicated in TABLE 4. The surprising finding here is that the first and largest discriminant function separates the sexes, not the three college criterion groups. This can be better visualized in FIGURE 1. The horizontal axis is Discriminant Function 1, and the males are on the left and the females are on the right. The vertical axis separates the three college groups with the corresponding male and female groups being at approximately the same level on Discriminant Function 2. That is, FIGURE 1 is simply a plot of information of TABLE 4 showing locations of the different groups. These group locations summarize the profiles of each of the groups on the 14 variables used in this anlaysis.

In terms of the original 14 variables, the composition of the discriminant functions is indicated in TABLE 5. In the first column are the weights for Discriminant Function 1. Those variables with high positive loadings indicate the female end of the function. That is, the girls tended to have higher scores for the positively loaded variables. Variables with high negative loadings indicate the male end of the function. That is, the males tended to have higher scores for the negatively loaded variables.

TABLE 5

Scaled Discriminant Vectors

	1	2
R-102 Vocabulary	—.23	—.14
R-103 Literature	.27	.36
R-105 Social Studies	—.29	—.11
R-106 Mathematics Info	—.24	.67
R-107 Physical Science	—.44	—.09
R-108 Biology	—.07	.07
R-211 Mem. for Sentences	.14	.14
R-220 Disguised Words	.08	.11
R-230 English Achievement	.57	.37
R-250 Reading Comp.	.35	.38
R-260 Creativity	—.24	—.22
R-290 Abstract Reasoning	—.03	—.02
R-340 Mathematics Achievement	—.09	.09
F-410 Arithmetic Computation	.04	.09

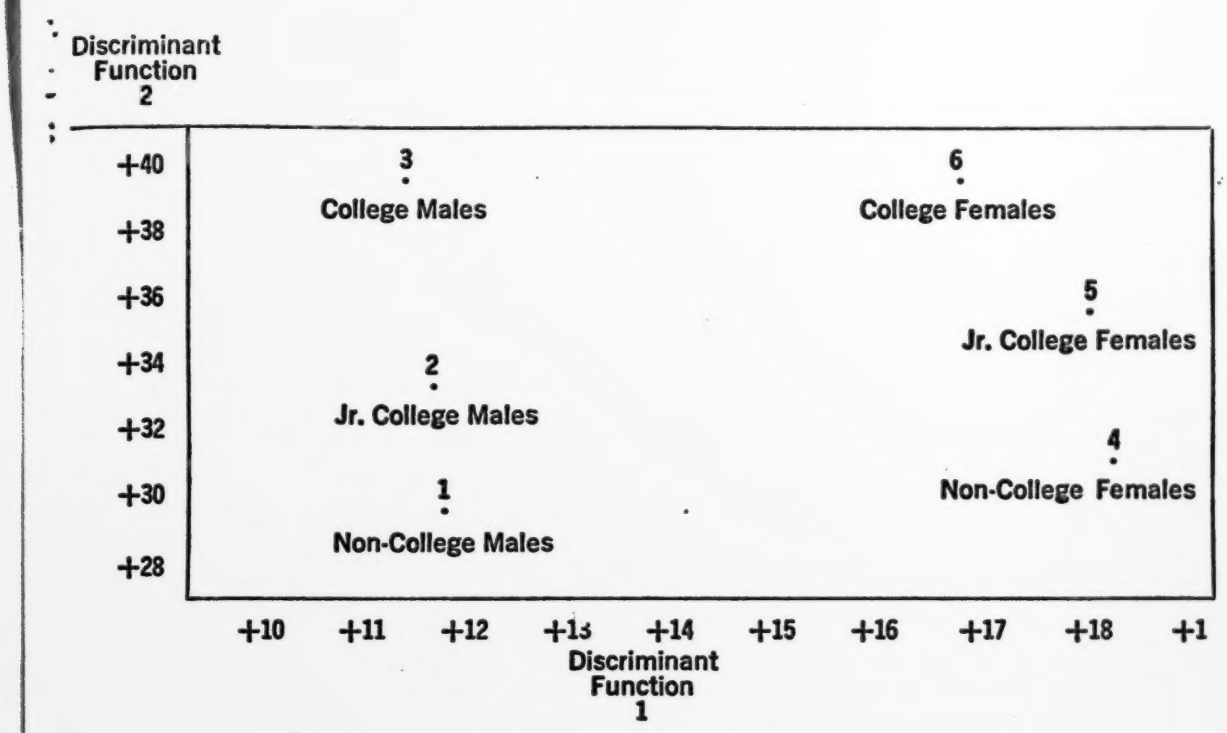

Figure 1. Centroids of Groups in Ability Discriminant Space

Thus the females did better than did the males on Literature Information, Memory for Sentences, English Achievement, Reading Comprehension, and Arithmetic Computation. The males did bettter on Vocabulary, Social Studies, Mathematics, Science, and Creativity.

In Discriminant Function 2, which separates the three college groups, the high positive loadings are indicative of college going. The most potent predictor of going or not going to college seems to be the Mathematics Information scale with a loading of .67. This is contrasted with Abstract Reasoning ability which has essentially no loading at all. In this second discriminant function negative loadings seem to be acting as suppressor variables in the prediction.

Another way of summarizing these data multivariately is indicated in TABLE 6. Mahalanobis has provided us with a way of measuring differences among groups taking into account any number of variables. In other words, this is a measure of group profile similarity. In terms of the 14 variables analyzed here, TABLE 6 tells us that the junior college students look more like the non-college students than like the college students. The higher the number in TABLE 6 the larger the distances between that group pair or, conversely, the smaller the number, the greater the profile similarity.

TABLE 6

Mahalanobis Distance Matrix

	NCM 1	JCM 2	CM 3	NCF 4	JCF 5	CF 6
Non-College Males	.00	.66	1.61	1.72	1.77	2.01
Jr. College Males	.66	.00	1.01	1.77	1.83	1.84
College Males	1.61	1.01	.00	2.36	2.26	1.62
Non-College Females	1.72	1.77	2.36	.00	.71	1.41
Jr. College Females	1.77	1.83	2.26	.71	.00	.96
College Females	2.01	1.84	1.62	1.41	.96	.00

TABLE 7

Mahalanobis Distance Matrix—Socio-Economic Variables

	NCM	JCM	CM	NCF	JCF	CF
Non-College Males	.00	.76	1.14	.54	.82	1.22
Jr. College Males	.76	.00	.57	.67	.31	.72
College Males	1.14	.57	.00	.95	.45	.44
Non-College Females	.54	.67	.95	.00	.74	1.08
Jr. College Females	.82	.31	.45	.74	.00	.51
College Females	1.22	.72	.44	1.08	.51	.00

Further observations of TABLE 6 reveal that the differences among the three male groups are similar to the differences among the three female groups. As in the discriminant analysis, the differences between the sexes are greater than the differences among the three college criterion groups. Turning now to the socio-economic cultural variables, quite a different set of trends is observed.

THE SOCIO-ECONOMIC CULTURAL VARIABLES

In order to obtain an estimate of the general socio-economic cultural environment from which these students come, seven items from the Student Information Blank (SIB) of the Project TALENT battery were used. These seven items concerned mother's and father's education, the father's job, the number of books in the home, whether or not the student had a room, desk, and typewriter of his own at home, and two items on the extent to which luxury appliances and electronic equipment (TV, etc.) were present in the home. Once again the junior college group falls between the non-college and college group in every case.

Turning to multivariate procedures for assisting in the interpretation of the group trends, TABLE 7 presents results of the Mahalanobis distance analysis. One important trend here with respect to junior college students is that the junior college males have the same general pattern of socio-economic background as do the junior college females, at least in terms of these seven variables. In fact, this is the first time that the application of this D^2 technique to Project TALENT data has resulted in a distance measure so small (.31) it is not even significantly different from zero. In fact, in terms of the socio-economic variables, the two sexes are quite similar within the college and within the non-college groups also. The most interesting trend here is that in terms of socio-economic variables, junior college groups are more like the college groups than the non-college groups. This is an important contrast to the ability trends.

The results of the discriminant analysis of these socio-economic data are quite different from the ability data. Only one discriminant function seems to be necessary for separating the six groups, and that function is primarily separating the three criterion groups with respect to college, regardless of sex. This is shown in TABLE 8 where the centroids for the six groups are listed as the first discriminant function. This discriminant function accounts for 80 per cent of the discriminating variance available in these seven economic predictors.

Of course, all seven variables are significantly related to membership in these six groups, but the relative predictive power among the seven variables is interesting (TABLE 9). There are two ways of thinking about this question. One is to examine the weights in the discriminant function, thus giving the contribution of the predictor in combination with the other predictors. The other way is to look at the F ratio for each variable individually with respect to the differences among the groups and within the groups for that variable. In

TABLE 8

Socio-Economic Centroids

Non-College Males	7.17
Jr. College Males	8.28
College Males	9.05
Non-College Females	7.59
Jr. College Females	8.53
College Females	9.22

this particular case, the discriminant function weights and the individual F ratios result in similar interpretations. The largest group differences in terms of among-group variability are for the SIB Item 195 which asks the extent to which the student has his own room, his own study desk, and typewriter. Next in importance are father's job and mother's education. It is interesting to note that the mother's education is more related to group membership here than is the father's education. Closely following the number of books in the home, which is the next best predictor, are the remaining four variables.

COMPARISONS OF ABILITY AND ENVIRONMENT

It is extremely difficult to make reasonable comparisons between the relative nature of the group differences in ability as compared to environment. The main reason for this difficulty is that much more is known about our measures of student ability than is known about our measures of student environment. As more is learned about the reliability and validity of these environmental items or factors based on them, it will be possible to make inferences about whether ability is more important than environment in this decision, or vice versa.

Both ability measures and environmental measures are very much involved in determining whether a student goes to college, junior college, or to no college at all. There is a tendency for junior college students to be more like non-college students in terms of ability, and slightly more like college students in terms of socio-economic factors. This is true for both males and females.

TABLE 9

Relative Predictive Power of the Socio-Economic Variables

SIB Item	Discriminant Function I	F-Ratios
176 No. of books	.32	16.5
190 No. of appli.	.14	12.6
191 No. of elec. appli.	.20	9.6
195 Own room	.58	22.4
206 Father's job	.48	19.5
218 Father's educ.	.30	14.4
219 Mother's educ.	.43	19.5

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